ACQUISITION REFORM – WHAT'S REALLY BROKEN IN DEFENSE ACQUISITION

BY

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The United States has been in a persistent ground campaign in the Middle East for eight years. With the exception of the Vietnam War, this engagement is longer than any conflict the United States has been engaged in throughout its history as a nation. To aid in prosecuting this war and countering future threats to the United States, the *Department of Defense* (DoD) must ensure military forces have the right mix of military weapon systems to maintain the technological advantage over our adversaries.
DoD has lost billions of dollars on failed weapon system development efforts due to the inability to successfully meet desired goals associated with development programs. These programs include the development of Army air and ground vehicles, Navy ships and submarines, and Air Force aircrafts. As we continue to investigate ways to reform the defense acquisition process, we must also rethink the methodologies and processes we use across the entire DoD decision support systems to meet our defense needs. If we do nothing to address the need to get capabilities to our military forces in a more timely manner, we will continue to lose critical resources (personnel, funding, and time) allocated for the defense of our country, which will also limit our technological advantage around the world.
The defense acquisition process is centered around three major decision support systems within the DoD—the *Joint Capabilities Integration Development System* (JCIDS); the *Planning, Programming, Budgeting and Execution* (PPBE) system; and the *Defense Acquisition System* (DAS). To ensure we are doing all it takes to deliver needed capabilities to military forces in a timely manner, we must ensure all three systems are optimized and synchronized. This research paper examines the three DoD decision support systems, identifies deficiencies as related to defense acquisition, and explores ways to optimize deficient areas to aid in delivering military capabilities in a timely manner.

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Introduction

The United States strength as an industrialized nation has driven us to greatness throughout the nineteenth and twentieth centuries. This led to our declaration as the world's sole superpower as we entered the twenty-first century. This declaration is directly related to our military and military weapon systems development. Technology has made a tremendous impact on US military forces in the prosecution of war. It has played an extensive part in revolutionizing the way battles are fought. There were more major military technological innovations during World War I than any other war in history. These innovations consisted of aircrafts, submarines, tanks, machine guns, high explosive artillery rounds, chemical munitions, and electronic communications. The United States strength in innovation was also displayed at the highest level during our engagement in *World War II* (WW II). This was supplemented with the buildup of the US industrial facilities to support the manufacturing of military supplies and equipment in the execution and sustainment of WW II.[1] As the United States engagements continued with commitments in support of the Cold War, the Korean War, the Vietnam War, the Gulf Wars, and other campaigns of the twentieth and twenty-first centuries, so has our commitment to develop and deliver on innovations.

> Likely adversaries can be expected to pursue and adapt any methods and means that confer an advantage relative to U.S. military power -- including methods that violate widely accepted laws and conventions of war. Even an advanced military power can be expected to adopt some methods considered "irregular' by Western standards, while nonstate actors increasingly are acquiring and employing 'regular" military capabilities. Rather than attempting to defeat U.S. forces in decisive battle, even militarily significant states are likely to exploit increasingly inexpensive but lethal weapons in an erosion strategy aimed at weakening U.S. political resolve by inflicting mounting casualties over time.[2]

In order for us to deliver the needed weapon systems, which are necessary to maintain an advantage over adversaries, we must modernize the entire defense acquisition process. This process consists of three major decision making systems within

the *Department of Defense* (DoD). They are the *Planning, Programming, Budgeting and Execution* (PPBE) system, *the Joint Capabilities Integration and Development System* (JCIDS), and the *Defense Acquisition System* (DAS). The *Office of the Secretary of Defense* (OSD) as well as each service and agency across the DoD directs a responsible agency to provide oversight for each decision-making system, which ultimately supports force structure within each service and across the department. These decision support systems are called *Big A acquisition*.[3] This research paper reviews the three DoD decision support systems, examines several successful and failed acquisition programs, highlights failures of Big A acquisition, and outlines recommendations to optimize the process to deliver capabilities in a timely manner.
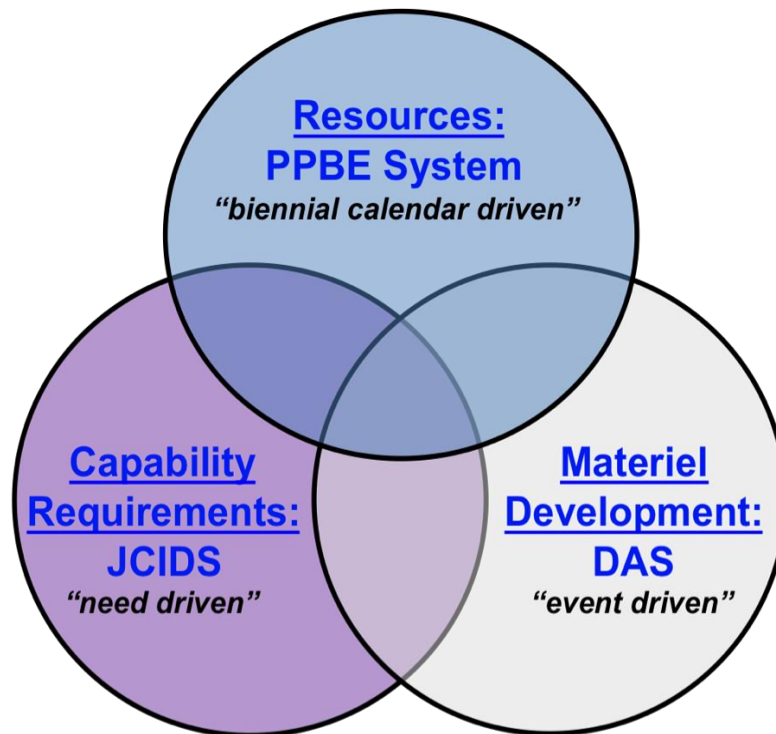

Figure 1. Three major decision support systems for Big A acquisition.[4]

Big A Acquisition and the DoD Decision Support System

> In order for us to get capability out faster, and we see this today in our many rapid development efforts, we must look at more than just buying things. There are several other entities involved in the entire process to include the requirements community, the resource community, the testing community, and the sustaining community. These communities are all outside the "small a" acquisition process. They are a part of "Big A" acquisition. They all have separate processes and governance…[5]

Resources

PPBE reflects four areas of emphasis. The first is *planning*, which is used to develop strategy for the DoD. This is followed by *programming*, which translates planning into a balanced allocation of forces, manpower, materiel, and funds for a specific period. Next is *budgeting*, which expresses resource requirements with emphasis on the first two years of the approved six-year program. The last phase is *execution*, which highlights real world aspects to the process.

> The purpose of the Planning, Programming, Budgeting, and Execution (PPBE) process is to allocate resources within the Department of Defense. The PPBE is a cyclic process that provides the mechanisms for decision-making and provides the opportunity to reexamine prior decisions in light of changes in the environment (e.g., evolving threat, changing economic conditions, etc.). The ultimate objective of the PPBE is to provide the Combatant Commanders (COCOMs) with the best mix of forces, equipment, and support attainable within established fiscal constraints. [6]

The PPBE System is a process designed in early 1960 to help make decisions on resource allocation within the DoD. The system was architected during the Kennedy administration by Mr. Charles Hitch and Mr. Alain Enthoven from the RAND Corporation. Mr. Robert S. McNamara, the eighth US Secretary of Defense, recruited Mr. Hitch and Mr. Enthoven to design a system to deal with budget and funding issues within the DoD. The system would address issues associated with a duplication of efforts across the military services, budgeting consequences for future-year spending, and decision making among competing service proposals. The system focuses on the assessment of current and future requirements of the DoD. Originally defined as *Planning, Programming, and Budgeting System* (PPBS), the process has gone through

many changes over the past 45 years primarily to make the process more responsive to outside pressures. The Army added execution to the process in 1981 and re-titled it *Planning, Programming, Budgeting and Execution System* (PPBES) to emphasize the importance of addressing the real world aspects of the process. In 2003, DoD changed the process to PPBE and the Army and other services changed to PPBE as well. To ensure there is a basic understanding of PPBE, the next several paragraphs will highlight each element. This section will start with a few basic definitions to keep things in context.

> Resources are the people, equipment, land, facilities, and their necessary support funding. Planning provides a list of approved requirements that need resources. Requirements are established needs justifying the timely allocation of resources to achieve a capability to accomplish approved military objectives, missions, or tasks. Programming groups the requirements into logical decision sets, allocates six-year resources among those sets, and selects those that fit within the resource limits. Budgeting focuses on the first two years of the six-year program and rearranges the programs under congressional appropriation groupings and submits the resulting two-year budget to Congress for review and approval of the first year.[7]

Planning. The first step in any operation, activity, or process is planning. It also initiates the DoD resource allocation process. This planning phase include actions by both OSD policy makers within the Office of the Under Secretary of Defense and the military leadership within the Joint Chiefs of Staff with participation by all military services and *geographic combatant commands* (GCCs). Though this process is led by OSD, each military service plays a significant role in it. Receiving guidance from the Office of the President, this process culminates with the *Joint Programming Guidance* (JPG) issued by the DoD.[8] This phase identifies the capabilities required to deter and defeat threats and it defines the national defense policies, objectives, strategy, and guidance for resources and force requirements to meet the capabilities.[9] It begins three years in advance of the fiscal year for which budget authority will be requested.[10]

Programming. Programming is the second phase of PPBE and is responsible for the alignment of resources to support the roles and mission of the services and defense agencies. This phase translates guidance into detailed resource requirements, which include forces, personnel, and funding. This is accomplished through the systematic review and approval processes that provide cost estimates for force objectives and

personnel resources in financial terms for six years into the future, which gives the Secretary of Defense and the Office of the President an idea of the impact that present day decisions will have on the future defense posture.[11] The *Director for Program Analysis and Evaluation* (D, PA&E) within OSD is responsible for coordinating efforts throughout this phase.[7] The Army produces a product called the *Program Objective Memorandum* (POM) every even fiscal year, which displays the Army programs over a six-year period. The POM includes an analysis of missions, objectives, alternative methods to accomplish objectives, and allocation of resources. It is merged with the *Budget Estimate Submission* (BES). The POM/BES, in addition to an Executive Summary, is transmitted to the Secretary of Defense, which includes both a narrative and a database in a format prescribed by OSD.[12]

Budgeting. This phase is responsible for the development of detailed budget estimates for the budget years of the programs approved during the programming phase. After the POM/BES is submitted, a review is conducted by the *Office of Management and Budget* (OMB) in which they emphasis proper budget justification and execution. They also consider alternatives that are developed for specific programs. The POM and BES are reviewed concurrently because it is more efficient to review both documents, which contain similar issues. Results of this phase end with the issuing of *Program Budget Decisions* (PBDs) by OMB.

Execution. Execution is the final activity in the PPBE process, which occurs concurrently with the program and budget reviews. The program review is responsible for prioritizing the programs which best meet military strategy needs. The budget review decides how much to spend on each program. The execution review assesses what is received for the money spent. Performance metrics are used to measure program achievements and attainment of performance goals. These metrics will be analyzed to ascertain whether resources are appropriately allocated.

As we continue to examine ways to deliver systems and capabilities to the soldier, we must also explore the possibility of providing adequate resources to acquisition programs across the long-term realities of system development. Figure 2 represents the events of a 2-year budget cycle over 4 years.
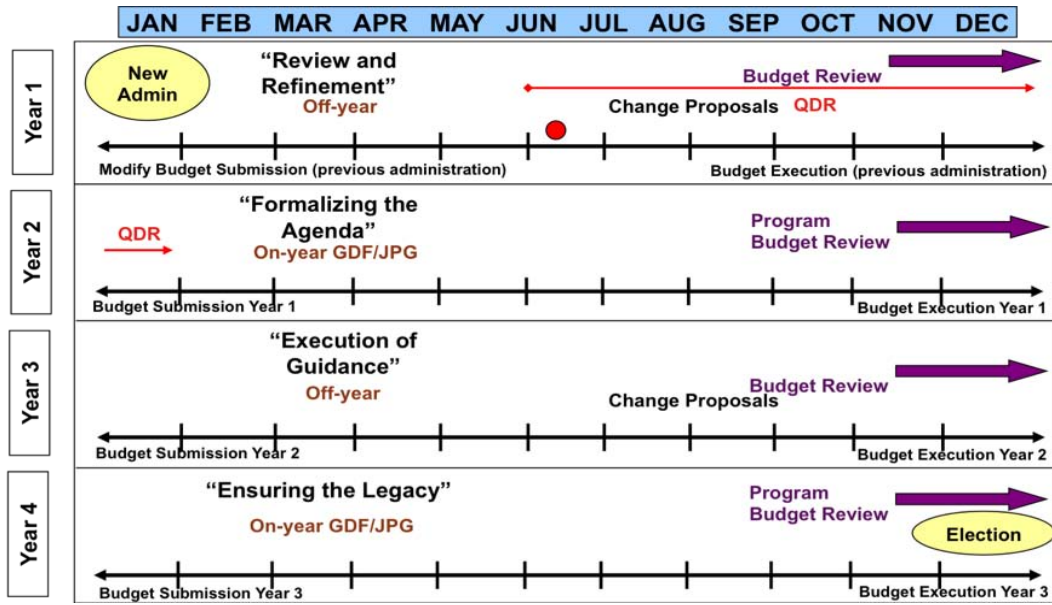
Figure 2. Summary DoD On and Off year: 2-Year Budget Cycle.[13]

> PPBS Reality – When faced with a 20-year threat, the government responds with a 15-year plan, carried out by a 6-year defense program, managed by 3-year personnel, prepared in 2-year budgets, funded by 1-year appropriations, which are usually 3-6 months late, which is actually formulated over a 3-day weekend and approved in a 1-hour decision briefing.[14]

Capability Requirements

The current requirements determination system, the *Joint Capability Integration and Development System* (JCIDS), is a joint Services process adopted in 2003 to address issues associated with the old system, which was called the *Requirements Generation System* (RGS). Some of the issues surrounding the old system included: not developing requirements in a joint force context, lack of overarching construct for objective analysis, systems not integrated, duplication between Services (particularly in small acquisition programs), culture aimed toward 100% solutions, and a process that lacked prioritization of joint warfighting demands.

> The requirements process known as Joint Capabilities Integration and Development System (JCIDS) has now been in use for 6 years. The Department of Defense (DoD) is continually updating the rules by which it develops and fields the capabilities needed by our military forces. The process articulated and promulgated in the Chairman, Joint Staff Instruction

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3170.01 series is complex and time consuming, and requires programs in DoD to be in compliance.[15]

The new system was also instituted to address issues associated with the lack of a systems oriented threat-based assessment to a capability-based assessment in order to identify current and future gaps in our ability to carry out Joint Warfighter missions.[16] The JCIDS process primary objective is to identify joint forces' capability gaps and conduct an assessment associated with *doctrine, organization, training, materiel, leadership and education, personnel, and facilities* (DOTMLPF) to eliminate the gaps. Policy and procedures outlining the JCIDS process are documented in the *Chairman of the Joint Chiefs of Staff* (CJCS) 3170.01 publication.[17] The *Joint Requirements Oversight Council* (JROC) provides oversight of the JCIDS. The JROC is responsible for validating and approving documentation for all *Major Defense Acquisition Programs* (MDAP) and *Major Automated Information Systems* (MAIS). The *Joint Capabilities Board* (JCB) assists the JROC in executing its duties and responsibilities.

The *Army Training and Doctrine Command* (TRADOC) serves as the Army's Combat Developer and is responsible for documenting and validating all Army warfighter capabilities. TRADOC fosters innovation across the Army and serves as the Army's agent for change. Their mission includes producing concepts, identifying future operational capabilities, participating in assessments and analysis, leading participation in *science and technology* (S&T) assessment, sponsoring experiments, using experimental insights to determine potential capabilities, and documenting and defending required capabilities.[18]

Combat developers, battle laboratories, *TRADOC analysis centers* (TRAC), research laboratories, and S&T centers are responsible for Army analyses within the JCIDS process. A *Functional Area Analysis* (FAA), a *Functional Needs Analysis* (FNA), a *Functional Solution Analysis* (FSA), and a *Post Independent Analysis* (PIA) are minimum analyses that must be conducted in support of a materiel solution.[19]

The output of JCIDS analysis is three documents, which defines needed capabilities, guides materiel development, and directs the production of capabilities. Each document supports a materiel development major decision.[20] The *initial capabilities document* (ICD) defines the capability need and where it fits in broader concepts, which

supports the decision to approve or deny a concept demonstration at "Milestone A" decisions.[20] When the technology development phase is complete, a *capability development document* (CDD) is produced which provides more detail of the materiel solution and supports "Milestone B" decisions.[21] The CDD also defines thresholds and objectives against the capability to be measured.[22] Lastly, the *capability production document* (CPD) supports the "Milestone C" decision, which is necessary to start the Production and Deployment Phase of the acquisition process.[23] This also includes low-rate initial production and operational tests.[24]

The *Army Capabilities Integration Center* (ARCIC) is a TRADOC subordinate organization responsible for providing Army oversight of the requirements determination process.[25] In addition to the JCIDS process (a deliberate requirements determination process), the Army uses an accelerated development process to address urgent capability requirements.[26] The accelerated process is documented in an *Operational Needs Statement* (ONS). Joint urgent operational needs, which are identified by GCCs, are called *Joint Urgent Operational Needs* (JUONs).[27] Both ONS and JUONs are deficiencies, if not addressed immediately, would seriously endanger personnel or pose major threats to ongoing operations.[28] The below figure is a snapshot of the number of major Army requirement documents as of January 2010. It shows the number of major Army programs with requirement documents under development/being staff across the Army and Joint Staff. It does not portray a true picture of all Army program requirements competing for resources.

Title	Request to Approval to Initiate	Initiation to Received (proponent days to write)	Received to Validated	ARSTAF time in 1-star staffing	TRADOC Response Time to ARSTAF 1-star comments	ARSTAF time in 3star staffing to AROC approval	TRADOC Response Time to ARSTAF 3-star comments	TRADOC Response Time to J-Staff O6 comments
Approved Docs By Proponent:	17.3	22.5	0.0	23.3	9.3	134.3	242.7	377.0
Maneuver CoE	18.0	24.7	0.0	18.7	0.0	160.0	129.0	373.0
Armor	29.7	16.8	0.0	43.8	16.5	154.5	295.7	570.7
Infantry	29.5	36.3	0.0	32.0	19.5	172.7	204.8	444.3
CAC								
ATSC	35.0	12.5	0.0	15.5	11.5	68.5	174.5	243.0
Intelligence	24.5	81.0	0.0	44.5	20.0	258.0	608.8	608.8
Signal	32.4	29.6	19.5	37.7	13.0	187.1	132.6	421.9
Fires CoE	26.5	34.8	0.0	27.4	44.0	187.9	113.6	335.7
Field Artillery								
Air Defense Artillery	24.0	0.0	0.0	13.0	0.0	76.0	57.0	133.0
Sustainment CoE	37.1	54.7	0.0	49.3	16.0	289.5	142.8	437.9
Transportation	37.3	49.0	17.0	58.8	28.9	263.6	98.7	393.6
Ordnance	43.1	35.0	26.0	30.7	21.0	168.2	105.6	295.4
Quartermaster								
MANSCEN	44.7	31.4	0.0	36.8	25.7	320.5	333.7	27-Dec-01
Chemical	41.7	20.0	0.0	56.5	25.4	4-Oct-00	427.2	735.9
Engineer	25.3	31.3	24.0	62.6	84.7	161.0	502.9	573.6
Military Police	18.0	0.0	0.0	0.0	0.0	78.2	43.0	139.2

Figure 3. Number of requirement documents and time spent in staffing.[29]

Materiel Development

The *Defense Acquisition System* (DAS) is a process used by the DoD to research, develop, and deliver needed weapon systems to military forces in a timely affordable manner. The DoD 5000 series directives govern the process. DAS is flexible, encourages innovation, and allows for decentralized acquisition. DAS is a complex system of delivering capabilities, which pulls together the functions in the requirements determination process and the budgeting process. DAS is driven by the defense acquisition management framework, shown in Figure 4, and has gone through numerous changes over the past decade. The framework lays out the process for acquisition programs to proceed through a series of phases to coordinate major events necessary for program execution.
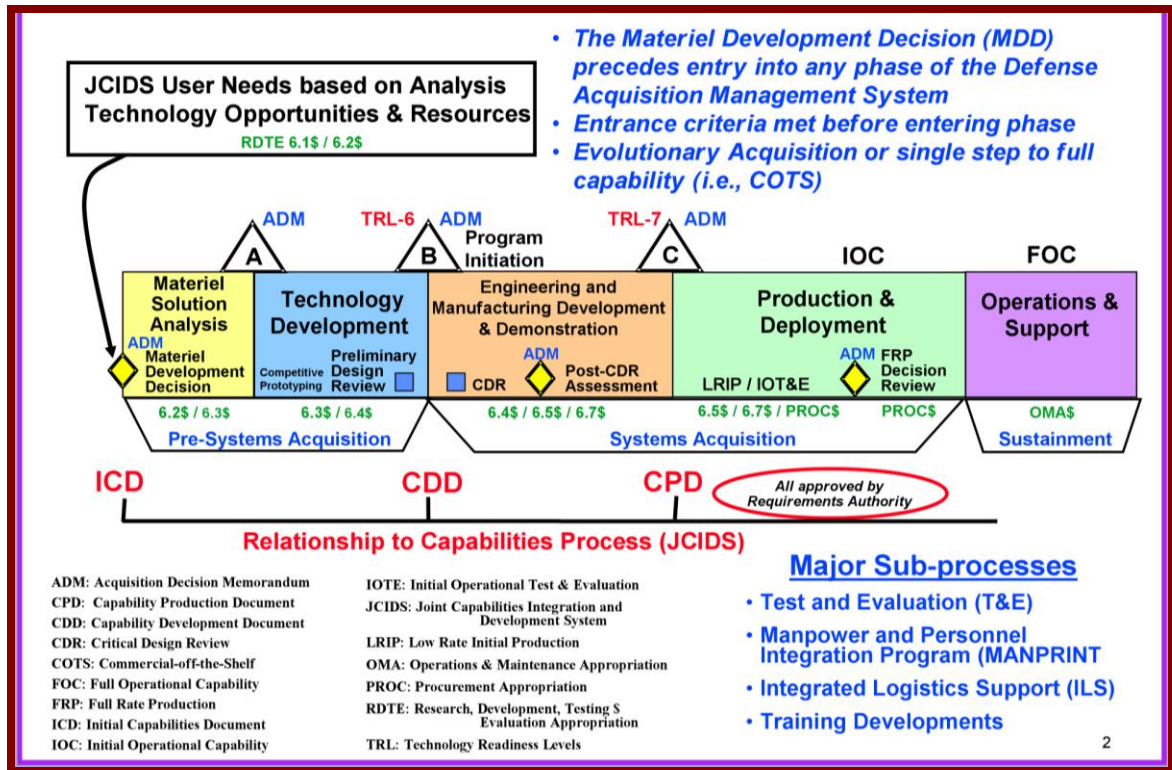
Figure 4. The Defense Acquisition Management System.[30]

The acquisition process consists of eleven distinct functional areas, which makes up the Acquisition Domain. These functional areas are:

- Plan and Direct DoD Acquisition

- Manage Science & Technology Program

- Formulate Acquisition Effort

- Manage Program

- Conduct Systems Engineering

- Conduct Financial Management

- Conduct Procurement and Contract Management

- Perform Acquisition Logistics

- Conduct Product Support (Sustainment)

- Manufacture and Produce System

- Conduct Test & Evaluation

Each military Service has its independent acquisition workforces to execute the functional areas within the domain. The executive agent for Army acquisition is the *Assistant Secretary of the Army for Acquisition, Logistics and Technology* (ASA(ALT)). ASA(ALT) has responsibility for providing enhanced support to the Army through proactive research, development, acquisition, and sustainment across the lifecycle of the weapon system.[31] These responsibilities constitute the execution of the eleven functional areas identified above which are also known as *small a* acquisition.

As the functional areas within small a acquisition are examined, it becomes evident it is a complex system of integrating many efforts. Efforts such as acquisition planning, procurement and contracting to hire the right industry partner, the development and transition of emerging technologies, maturation of technologies, evaluation of technologies during technical testing, and acquisition logistics planning efforts to aid in transitioning capabilities to military force structure. Figure 5 depicts the relationship between the requirements determination process and the defense acquisition process. It shows how complex both processes are and the necessity for close coordination and integration.
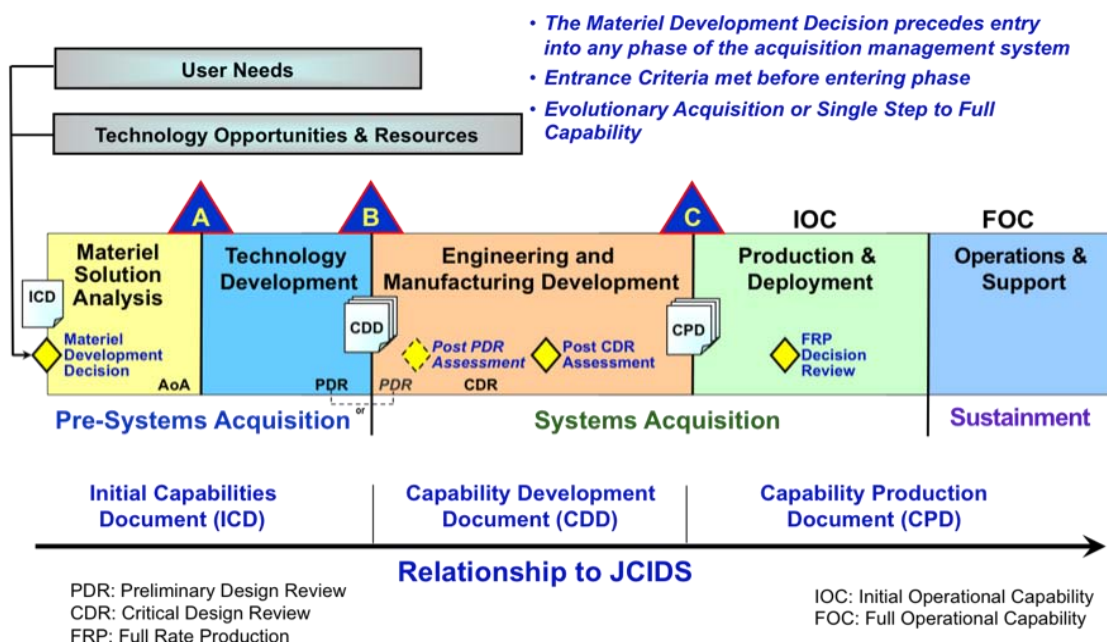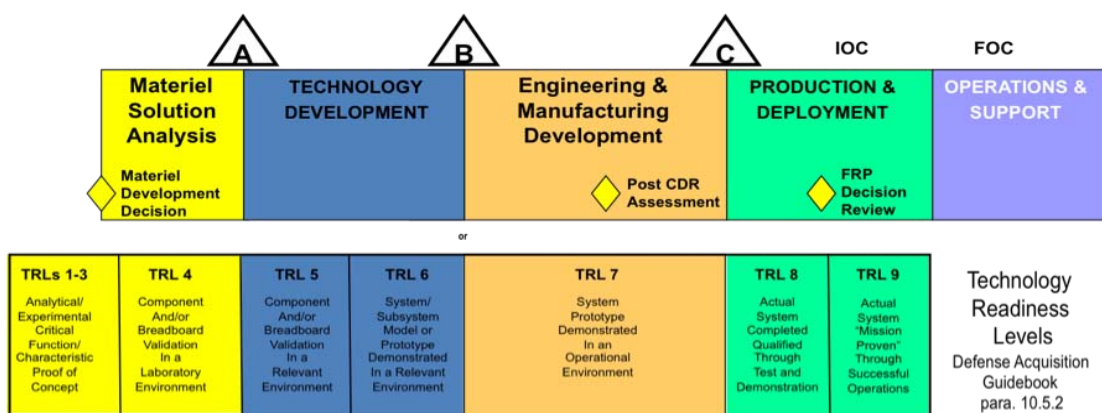

Figure 5. The Defense Acquisition System and the Relationship to JCIDS.[32]

One of the driving factors in meeting cost, schedule, and technical goals of an acquisition program is ensuring the emerging technologies are mature enough to transition into systems or capabilities to meet program initiation requirements. Accurately evaluating technology readiness is one of the most important parts of initiating an acquisition program. If the community transitions non-mature research projects into programs of record, there will be a shift of risk from research and development laboratories to acquisition program offices. This will also increase the risks of developing accurate program development schedules and cost estimates, which will inevitably cause program delays and cost growths during development. There is a central theme within the acquisition process that mature technologies should be employed prior to beginning system development. It is critical that program managers prove technology will work and can be demonstrated to a high level of maturity in order to lower development risk and avoid large cost overruns. Typically, for technology to be considered mature, technology must have been applied in a prototype article, tested in a relevant or operational environment, and found to have performed adequately for the intended purpose. Far too often we rush to integrate immature technologies into system design and development. Figure 6 depicts the desired technology maturity level within each phase of the acquisition life cycle. The more the acquisition community conforms to this desire, the less cost, schedule, and technical risk acquisition program developers will incur during capability development efforts.

Figure 6. The Defense Acquisition Management System and the relationship to Technology Readiness Levels (TRLs).[33]

Acquiring Systems and Capabilities—A Historical Background

Performance of Major Defense Acquisition Programs

Over the past thirty years, the defense acquisition process has delivered numerous systems and capabilities to counter the threat of the Cold War, defeat the Iraqi Army in two wars (Operations Desert Shield/Storm and Operations Iraqi Freedom), and fight terrorism in the mountains of Afghanistan (Operations Enduring Freedom). Over that time, we have made considerable adjustments in our national military strategies, which allow us to rethink our threats and make changes in force structure and materiel solutions to meet those threats. DoD has failed to provide needed capabilities in time to meet current threats, due to schedule and cost overruns. Some people across the defense community contribute these failures to flaws in the acquisition process. Many of the failures are due to changes in national defense strategies and the redefinitions during capability development efforts. This section will highlight and analyze several major program development efforts that are experiencing difficulties in performance due to several components of Big A acquisition.

From 2003 to 2008, the number of major DoD acquisition programs has grown nearly 18 percent with a total funding growth of $400 million (FY 2009 dollars). Research and development costs are 42 percent higher than original estimates, and average delays in delivering capabilities are approximately 22 months. The statistic outlining the development performance is shown in Table I. This information is one indicator of how well DoD acquisition programs are delivering capabilities to warfighters.[34]

Table I. Analysis of DoD MDAP Development Performance[35]

	FY 2003	FY 2007	FY 2008
Number of Programs	77	95	96
Total Planned Commitments	$1.2 trillion*	$1.6 trillion*	$1.6 trillion*
Change to total RDT&E costs from first estimate	37%	40%	42%
Change to total acquisition cost from first estimate	19%	26%	25%
Total acquisition cost growth	$183 billion*	$301 billion*	$297 billion*
Share of programs with 25% increase in program acquisition unit cost growth	41%	44%	42%
Average schedule delay in delivering initial capabilities	18 months	21 months	22 months
FY 2009 dollars			

Of the major acquisition programs in 2008, the ten largest programs have experienced development cost growth from initial estimates totaling 32 percent. These estimates grew from approximately $135 billion to over $170 billion. Quantity buys were reduced from 6,645 to 4,503, and overall acquisition cost grew 13 percent. This constitutes a 32 percent reduction quantity buys.[36] Additionally, total program acquisition unit costs grew significantly. The *Joint Strike Fighter* (JSF), the *Future Combat Systems* (FCS), and the *Mine Resistant Ambush Protected* (MRAP) programs consumed a large amount of DoD funding. Their performance affects other acquisition programs, both large and small, across DoD and affects their ability to adequately fund and acquire other supplies and equipment. When examining these programs, there are multiple areas of Big A acquisition that have contributed to delays in completing program development and delivery.

The JSF program was designed to develop a premier strike aircraft to replace the US military's aging tactical fighter aircrafts. The program was based on a common design of three variants that shared 80 percent of their parts to keep development, production, and operating costs down. These variants included the *conventional take off and landing* (CTOL) variant, the *short-take off and vertical-landing* (STOVL) variant, and the carrier-

based *catapult assisted take off but arrested recovery* (CATOBAR) variant. The aircraft is intended to be the world's leading aircraft with close- and long-range air-to-air capability. The aircraft is required to be four times more effective than existing fighters in air-to-air combat, to be eight times more effective in air-to-ground combat, and to be three times more effective in reconnaissance and suppression of air defenses.[37] The aircraft is also required to have better range and less logistics support. Over the past couple of years, the program total acquisition costs grew more than $23 billion due to higher estimated procurement costs. Development costs remained the same by reducing program requirements and spending management reserve faster than budgeted. These reduced requirements included the elimination of an alternate engine program. Additionally, the program implemented a risk reduction plan to restore management reserves from about $400 million to about $1 billion by reducing test resources. Program performance data from 2001 to 2008, which includes the total percent change, is outlined in Table II.[38]

Table II. JSF, Program Performance (FY 2009 dollars in millions)[39]

	As of 10/2001	*As of 09/2008*	*Percent Change*
Research & Development Cost	$37,645.7	$46,840.8	24.4
Procurement Cost	$167,016.3	$197,437.3	18.2
Total Program Cost	$206,410.3	$244,772.1	18.6
Program Unit Cost	$72.020	$99.663	38.4
Total Quantities	2,866	2,456	-14.3
Acquisition Cycle Time (months)	175	125	-28.6

FCS was the United States Army's principal modernization program. The program was envisioned to create the next generation of manned and unmanned vehicles linked to a fast and flexible battlefield network. System development and demonstration of the FCS program started with deficit knowledge of best practices of developing a systems-of-systems network of capabilities. This deficiency put the program at risk of cost growth, schedule delays, and performance shortfalls. One of the factors that contributed to challenges during program execution was not having a match between resources and requirements at the beginning of system development and demonstration.[40] An additional factor was the integration of immature technologies during system

development and demonstration. Seventy-five percent of critical technologies were not mature, and requirements were not well defined at program initiation. Additionally, there were other events that contributed to challenges during development such as:

- Prototypes of 14 major systems planned to be brought together and tested for the first time after production decision.

- Lack of demonstration of production process maturity before making a production decision.

Although best practices suggest maturing technologies to TRL 7 prior to the start of system development and demonstration, the Army decided to integrate critical FCS technologies at TRL 6 or the Army expected many technologies to be at level 6 before the critical design review. The Army started the FCS system development and demonstration with approximately 75 percent of its critical technologies below level 7. Many of the critical technologies were subsequently assessed at level 5 and several at levels 3 and 4. Cost and schedule performance of FCS was directly related to the risk associated with the integration of immature technologies and instabilities of program requirements. Additionally, FCS development difficulties are attributed to a lack of independent, technically informed discussion within the Army's decision-making process. Figure 9 depicts the cost and schedule performance of FCS from 2003 until 2007.[41]

Table III. FCS, Program Performance (FY 2009 dollars in millions).[42]

	As of 05/2003	*As of 12/2007*	*Percent Change*
Research & Development Cost	$20,886.2	$28,835.2	38.1
Procurement Cost	$68,197.6	$100,160.9	46.9
Total Program Cost	$89,776.1	$129,730.6	44.5
Program Unit Cost	$5,985.076	$8,648.704	44.5
Total Quantities	15	15	0.0
Acquisition Cycle Time (months)	91	147	61.5

The *Mine Resistant Ambush Protected* (MRAP) program is a joint program, led by the Navy and Marine Corps, which was stood up to provide a family of armored fighting vehicles designed to combat *improvised explosive device* (IED) attacks and

ambushes in Iraq and Afghanistan. MRAP production is based on a *non-developmental item* (NDI) design from domestic and international companies who integrated a V-shaped hull and armor plating technology to provide protection against mines and IEDs. MRAP production is well under way and there are no identified outstanding technology, design, or production issues. The technology within the MRAP program is considered to be above TRL 7 and is a mature technology. Table IV shows cost and schedule performance of the MRAP program. Though there are changes in R&D, procurement, and unit cost from 2007 to 2008, this program demonstrated how acquisition-cycle-time could be streamlined by leveraging mature technologies.[43]

Table IV. MRAP, Program Performance (FY 2009 dollars in millions)[44]

	As of 12/2007	*As of 08/2008*	*Percent Change*
Research & Development Cost	$232.5	$408.6	75.8
Procurement Cost	$21,252.9	$26,265.5	23.6
Total Program Cost	$22,453.2	$27,642.1	23.1
Program Unit Cost	$1.460	$1.745	19.5
Total Quantities	15,374	15,838	3.0
Acquisition Cycle Time (months)	6	6	0.0

The analysis of the DoD's top three acquisition programs provides some insight into things the department should reform in Big A acquisition. However, there are other indicators in other Army failed programs over the past decade that also highlights similar deficiencies in defense acquisition.

Army Acquisition—Failures and Successes and Somewhere in Between

Within the Army, there were acquisition programs that went through research, development, and acquisition difficulty due to various reasons associated with one or multiple aspects of Big A acquisition. This section will examine the Crusader, Comanche, and Armed Reconnaissance Helicopter, three Army major acquisition programs that were cancelled over the past decade. These programs spent billion of dollars (sunk cost which will never be recouped) in defense appropriations, delivering no capabilities to the Army. We will briefly examine these three canceled programs and as

well as the Army Stryker program, which is considered a successful Army fielding, to compare the programs parallels and differences.

The Army Crusader Program, an $11 billion program, was targeted as the replacement for the aging 155 MM self-propelled howitzer and re-supply vehicle. The Army Field Artillery School originally validated the requirements for the Crusader in the early 1980s under a different name: the *Advanced Field Artillery System* (AFAS). During 20 years of development, the program went through program restructures, numerous requirement changes, and several technical challenges. The Army spent $2 billion over the twenty-year development effort prior to canceling the program in May 2002.[45] Challenges over the 20-year development effort include:

- Technical difficulty in integrating liquid propellant in firing solution (reverted back to power propellant).

- Critical technologies integrated into the program below the requisite TRL.

- Reduced force structure from 24 guns/battalion to 18 guns/battalion to reduce fielding cost.

- Per unit cost increased from $14.7 M to $25 M—inability to take advantage of economies of scale.

- Requirement changes to better support Army transformation (weight reduction effort).

- Changes in resupply vehicle (50% tracked/50% wheeled).

- Program restructures to gain improvement in indirect fire support capability.

- Program canceled—deemed neither mobile nor precise enough.

The Army Comanche Program, a $39 billion Army Aviation program, was targeted to be the next generation armed reconnaissance helicopter. Initial development began in 1983, and the first prototype helicopter conducted initial flight test in January 1996. After 22 years, six program restructures, and approximately 7 billion dollars in development costs, the program was terminated in 2004 by the Army Chief of Staff to reallocate $14.6 billion across the Army.[46]

Challenges over that 20-year development effort include:

- $75 M increased in cost due to added test requirements.

- Delays in delivering pre-production aircraft needed for flight tests (19 month schedule delay).

- Delays in completing mission equipment package due to software development challenges.

- Increased risks due to concurrent development/testing.

- Requirement changes (e.g., fire control radar).

- 6 program restructures.

- Critical technologies integrated into the program below the requisite TRL.

- Per-unit cost increased from $5M to $23M.

In July 2005, the Army awarded the *Armed Reconnaissance Helicopter* (ARH) development contract to Bell Helicopters. This was a *system development and demonstration* (SDD) contract to build four helicopters with a goal of producing additional *commercial-off-the-shelf* (COTS) helicopters to replace the fleet of aging OH-58D observation helicopters as well as filling the gap created by the cancelled Comanche program. The initial cost of the ARH development contract was $211M.[47] Over the three years of system development and demonstration, the program encountered the following challenges:

- Delays in prototype aircraft first flight.

- Technical failures in prototype aircraft caused a serious accident destroying the aircraft (test pilots survived unhurt).

- SDD phase of the program grew to nearly $600 M.

- Program re-baselining, which included the purchase of additional flight test aircraft and work in support of aircraft qualification.

- Nunn-McCurdy cost and schedule breach in July 2008.[48]

- Program cancellation in October 2008 due to increased production cost – Per unit cost increased from $8.5M to $14.5M.

The Army Stryker vehicle is the first Infantry armored vehicle fielded to the military forces since the Bradley Fighting Vehicle in the 1980s. Stryker vehicles were developed to address the need to create armored vehicles that would deploy around the world quickly and provide the protection and lethality needed on the battlefield. The former Army Chief of Staff, General Eric Shinseki, championed the Stryker vehicle to serve as the premier vehicle for the Interim Brigade Combat Team as the Army transitions to the future force. The contract to build the Stryker vehicle was awarded to General Motors and General Dynamic Land Systems in November 2000. Details of program execution are shown below.[49]

- The first Stryker brigade became operational in October 2003—from conception to initial operational capability in approximately 3 years.

- Platform design based on the Canadian Infantry Carrier Vehicle—very mature technologies.

- Unit cost to purchase the initial Stryker was $3M in April 2002—decreased to $1.42 M in May 2003.

- Program costs increased ~22 percent from the November 2000 estimate of $7.1 billion to the December 2003 estimate of $8.7 billion—increase due to maintenance facility construction.

- Program execution support by senior leaders throughout execution.

When examining the above programs that were canceled over the past decade, they shared many of the same challenges and issues during execution. These challenges and issues consist of the integration of non-mature technologies, schedule slips due to technology challenges, cost growths, funding cuts, lack of funding stability during program execution, higher per unit costs due to inaccurate estimates and reduced production units (inability to take advantage of economies of scales), and lack of senior leader commitment over the long haul. Successes of the Stryker program were mainly centered on the integration of mature technologies, senior leader commitment throughout development, and stability in program funding.

As we examine ways to improve defense acquisition to make it more efficient, we should also understand previous reform initiatives to ensure we do not continue to repeat ineffective reform efforts of the past.

Acquisition Reform Initiatives

DoD has been on a quest to create an optimized acquisition process for several years. Since publishing the initial acquisition directive in 1971 (the original DODI 5000.01), there have been numerous commissions, studies, initiatives and reviews, which have made recommendations to improve the process over the past 30 years. The government's first substantial effort to examine procurement practices was in the early 1970's with the commission on government procurement. This commission made numerous recommendations focused on improving procurement practices. These recommendations include:

- Consolidating all statutory procurement regulations.

- Establishing an institute to provide acquisition education and services.

- Reducing management and administrative layers between policy makers and program offices.[50]

Not all recommendations were acted on, but the commission's recommendations led to the creation of the Defense Acquisition Regulation, which became the Federal Acquisition Regulation in 1984 by a presidential order signed, by President Ronald Reagan, to be effective across all federal government agencies.[51]

In 1981, the Acquisition Improvement Task Force headed by Deputy Secretary of Defense Frank Carlucci conducted another study to evaluate all facets of defense acquisition. It focused on ways to reduce weapon systems costs as well as improve weapon systems readiness and support.[52] The study led to the institution of numerous initiatives with the major ones also focusing on procurement and contracting procedures.

The next major reform initiative was in 1986 in which a blue ribbon commission, chaired by former Deputy Defense Secretary David Packard, recommended far-reaching recommendations such as:

- Creating an Under Secretary of Defense for Acquisition position.

- Creating an acquisition executive for each Service who would report to the Under Secretary of Defense for Acquisition.

- Creating program executive officers who would report to the Service acquisition executive.

- Providing more authority for the Chairman, Joint Chief of Staff in acquisition matters.[53]

These recommendations led to President Reagan signing the Goldwater-Nichols Act on October 1986, which implemented the major recommendations of the blue ribbon commission lead by Secretary Packard.[54] Though DoD has continued with acquisition reform efforts from 1986 to 2009, including several changes to the DoD Defense Acquisition Instructions and Directives, much of the Goldwater-Nichols Act still drives the acquisition process today.

Acquisition reform is an essential component in developing strategies of making smarter decisions on acquiring quality products in a fast and affordable manner; however, we must not continue to pursue the same actions expecting to produce a different outcome. After several reform attempts, major acquisition programs are still taking decades to complete development and delivery, and costing two to three times more than originally planned. To ensure we optimize our processes to reform acquisition to the fullest extent, we must ensure we examine all actors that participate in the total (Big A acquisition) process. The next section will highlight reform recommendations to address the deficiencies identified in major DoD acquisition programs.

Recommendations

As we look across the areas that make up Big A acquisition, there are numerous processes that should be examined to get capabilities to the end user in a timely manner. The following are recommendations in the major components of Big A acquisition: Requirements Determination, Resource Allocation, and Defense Acquisition (small a acquisition).

- Conduct a comprehensive overhaul of the requirements determination process – Joint Capability Integration and Development System (JCIDS). One of the goals of the JCIDS process was to streamline the time it takes to create the documentation. The streamlining never occurred, and it takes longer to develop and obtain all the approvals for requirement documents.

- Lock in baseline requirements upfront and prior to capability development. Today requirements are too volatile, not testable, and not providing the appropriate level of information to articulate warfighter needs.

- Eliminate the number of requirement documents needed throughout the development, production, and fielding of the capability. Today the community is required to construct a requirements document to support each major milestone of the program.

- Stabilize funding for all major programs. Acquisition programs have had to deal with more funding turbulence over the past few years due to the number of investments being made across DoD. These investments consist of the distinct number of acquisition programs, investments to increases in military personnel total strengths, and investments made in the execution of two wars.

- Conduct a comprehensive review of all acquisition programs across the Army and/or DoD: Look at the entire portfolio of programs across the department, determine what we can afford, then fully fund affordable programs and terminate the others. We must also develop a program termination process which help eliminates underperforming programs early in the development life cycle.

- Ensure testing community is held accountable for all funding requirements for operational testing. If ATEC makes changes based on additional testing requirements not originally planned and funded, they should account for the funding associated with the changes.

- Develop a uniform method of assessing technology readiness levels. Examine how programs obtain independent technical advice to support technical and programmatic decision-making.

- Develop realistic cost estimates at the beginning and throughout the program. We should not under estimate program costs just because the total program could be perceived as being unaffordable.

- Program offices must do a better job of identifying, assessing, and managing risk. Defense Acquisition University should place more emphasis on educating the acquisition workforce on risk management processes and procedures.

Conclusion

The truth is you can't fix the acquisition system. All the insiders know this…We can't fix it because we want crazy things. We want a system that can fire missiles from a submarine hiding beneath the surface of the sea and hit a target thousands of miles away. Or we want a tank that can survive a shaped charge round, pack its own lethal punch and is airlifted by a C-130. Systems have to perform reliably in the snow, in the mud, in the sand. They have to communicate with every friend and not reveal themselves to any foe. And we want them soon, not later.[55]

In today's acquisition environment, we will never obtain an optimized acquisition process without trust and transparency from Congress and DoD senior executives. We must make investment decisions early, upfront, and eliminate variations in resourcing. The assumption made by many is that the small a acquisition process is broken. While optimizing "small a" acquisition is something we should continue to pursue, it is not sufficient to meet the goal we are striving for which is to shorten the process and get capabilities out to the soldier faster. Twenty years is much too long to develop certain capabilities and in many cases ten years is too long as well. In order for us to get capabilities out faster, we must look at more than just procurement.

"Big A" acquisition is like a three-legged stool. If one leg fails, the entire effort will fall. We must optimize reform efforts of each leg of Big A acquisition. This includes making sure firm achievable requirements or "good enough" needs are identified upfront and making sure we determine and allocate resources up front and throughout the life of the development effort. We must define what our resource requirements are at program initiation. Once resource requirements are defined, we must ensure resources are allocated across the entire development life cycle. As we initiate acquisition programs, we must ensure the emerging technologies being integrated into capabilities are at the appropriate maturity level. If the technology is not accurately assessed, it will potentially create technical challenges in the future, turning into program delays, cost growths, and potential program cancellation. We must have trained personnel in all three components of "Big A" acquisition across the department. DoD commits millions of dollars training acquisition professionals to ensure the acquisition workforce have the appropriate tools to deal with decision making across all phases of defense acquisition. This is a business process, which is predicated on an educated workforce in all legs of the Big A acquisition to assist in exercising sound judgments.

As our engagements continued with our commitment in support of wars of the twenty-first century, so should our commitment to develop and deliver on innovations. Today's adversaries are much different from those of previous wars. They change their tactics at an unprecedented pace, which require us to respond with both force structure and military technology. To meet twenty-first century National Security challenges, US policymakers, and senior defense executives must provide the right guidance and latitude

in defense acquisition to ensure we deliver the needed technological capabilities in a timely manner. Our current processes must be transformed to support the twenty-first century warrior as effectively as it supported previous generations.

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